

# METHOD AND DEVICE FOR OPERATING A MICROPHONE SYSTEM, ESPECIALLY IN A MOTOR VEHICLE

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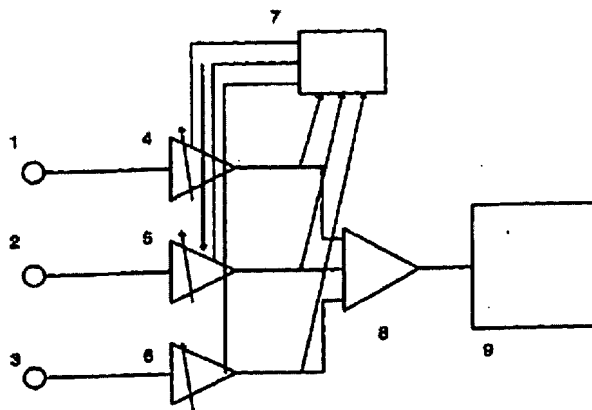
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## Abstract of WO9949698

The invention relates to a method and a device for operating a microphone system, especially in a motor vehicle, in accordance with the preamble to claims 1 and 6. To markedly improve the recording quality of the speech signal introduced into the system the invention provides for the speech sound to be detected in several different physical locations so as to track a virtual microphone location which is optimised in relation to a moving speech source. From the evaluation of variables such as operating time and/or phase and/or amplitude the individual microphone locations can be virtually weighted and the audio signals of the microphones can be added accordingly or combined in other ways.



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For the enterprise of a microphone arrangement, in particular in a motor vehicle the invention a procedure as well as a mechanism concerns procedures and mechanism for the enterprise of a microphone arrangement, in particular with a motor vehicle, in accordance with generic term of the patent claims 1 <RTI ID=1.1> and 6.</RTI>

Microphones and/or. Microphone arrangements become in motor vehicles the enterprise of the so-called free intercom, RTI <ID=1 in particular.2> over it </RTI> outside however also with Sprachverstärkungs-und< RTI ID=1.3> übertragungsanlagen< /RTI> and with plants for active squelch <RTI ID=1.4> needs.</RTI>

It is important, <to RTI ID=1.5> that< /RTI> <of the RTI ID=1.6> sound< /RTI> in direct <RTI ID=1.7> head proximity< /RTI> of the passenger and/or. the driver one takes up, and/or. to be taken up can. For this microphones within the range of the RTI ID=1 <mostly become.8> instrument panel< /RTI> or within the range of the roof armature or at <the RTI ID=1.9> inside mirrors< /RTI> arranged. With otherwise simple free speech mechanisms with in-car telephone plants or in addition, with languagesteered input interfaces to electronic <RTI ID=1.Simple> microphones< or> microphone arrangements often represent a problem to 10 devices /RTI. The language messages become thereby of driving noises <RTI ID=1.11> overlaid,< /RTI> which not only with free speech telephone systems but also with languagesteered input units becomes problematic.

From the DE 19608869 A 1 is a language control mechanism <RTI ID=1.12> for< /RTI> components in motor vehicles admits, with which <the RTI ID=1.13> manipulation< /RTI> of the control mechanism by the language a feedback generates, with which it can be guaranteed whether the control mechanism received the languagesteered instruction correctly. A language control mechanism of this kind concentrates also regarding its <RTI ID=1.14> microphone arrangement< /RTI> only on one conventionally microphone training and/or. Microphone arrangement.

From the DE 19533541 c1 a languagesteered control procedure is <RTI ID=1.15> similar< /RTI> kind admits.

Here however the language control is treated as such. In order to achieve here a safe operation, a very complex speech recognition procedure is used, with which the aspects <RTI ID=2.1> noise reduction,< /RTI> echo compensation, <RTI ID=2.2> characteristic extraction,< /RTI> Syntax-und semantics examination from each other separately to be treated. It concerns only, the available <RTI ID=2.3> Sprachsignale< /RTI> in <a RTI ID=2.to work over again> 4< optimum> /RTI way. An improvement of the language quality as such and/or. an improvement <of the RTI ID=2.5> language signal admission,< /RTI> remains here out of consideration.

From the EP 0721178 a2 a multi-channel communication system with several microphones and several loudspeakers is well-known. The entire plant is laid out for RTI <ID=2 thereby.6> at least< two> persons speaking for /RTI, who are to each other switched into transmission/receive mode. <The RTI ID=2.7> transfer means< /RTI> select the language message from a total noise window blind. With an application <RTI ID=2.8> for< /RTI> motor vehicles a so-called error or comparison microphone RTI <ID=2 becomes.9> over< /RTI> the seat belt very close to the speaking person brought. The microphone place is also here fixed. In all other respects the execution is <RTI ID=2.10> in accordance with< /RTI> of this writing designed for the transmission/receive mode of two or several persons.

Like that is the moreover from the EP 0773531 a2 <a RTI ID=2.11> frequency-selective< /RTI> <RTI ID=2.12> Konrollsystem< /RTI> <RTI ID=2.13> RTI< ID=2> acoustic <for /RTI.14> plants< /RTI> admits. Here the prevention of the RTI <ID=2 stands.15> over-regulation< /RTI> in the foreground. An improvement of the receipt quality of the language message remains here except eight. A system <RTI ID=2.16> similar< /RTI> kind is well-known also from the EP 0721179 a2. The adaptive tonal RTI ID=2 <revealed there.17> control system< /RTI> to <the RTI ID=2.18> elimination< /RTI> von Stabilitätsproblemen treated vordergründig likewise the prevention of the over-regulation already mentioned.

<RTI ID=2.This> cross section< from> the state of the art shows 19 fundamental /RTI that one itself <RTI ID=2.20> in principle< /RTI> with the improvement of the RTI ID=2 <already received.21> of Sprachsignales< /RTI> <RTI ID=2.22> employs.</RTI> an improvement of the photograph quality on the place of the language production becomes however multiple, if not even in principle neglects.

The invention continues to be the basis thus the task, a procedure as well as a mechanism of the genericin accordance with-eaten kind going by to <RTI ID=2.23> develops,< /RTI> that the photograph quality of the RTI ID=2 entered into <the system.24> of Sprachsignales< /RTI> <RTI ID=2.25> in principle< /RTI> one improves.

<The RTI ID=3.1> /RTI< posed> task is with a procedure <of the RTI ID=3.2> would genericin accordance with-eat< /RTI> kind <RTI ID=3.3> according to invention< /RTI> by the characteristic characteristics of the patent claim 1 <RTI ID=3.4> drawn.</RTI>

Regarding a mechanism <of the RTI ID=3.5> would genericin accordance with-eat< /RTI> kind is <the RTI ID=3.6> /RTI< posed> task <of RTI ID=3.7> according to invention </RTI> by the characteristic characteristics of the

patent claim 6 <RTI ID=3.8> solved.</RTI>

Further favourable arrangements <of the RTI ID=3.9> /RTI< according to invention> of procedure are into <the RTI ID=3.10> requirements< /RTI> 2 to 5 indicated, and large arrangements regarding <the RTI ID=3.11> /RTI< according to invention> mechanism is into <the RTI ID=3.12> remaining< /RTI> patent claims 7 to 10 indicated.

Central point with the invention both in <RTI ID=3.13> more verfahrensgemässer,< /RTI> and in <RTI ID=3.14> einrichtungsgemässer< /RTI> regard, is the definition virtual of an optimized microphone place. This is specified intended virtuel, where the language source is, D. h., at the place of the head of the speaking person. This so-called spatial noise or language source recognition knows z. B. <RTI ID=3.15> by means of< /RTI> Laufzeitmessung to be made. During a multiple arrangement of microphones this leads to the fact that <RTI ID=3.16> during< /RTI> of the speech procedure <RTI ID=3.17> by means of< /RTI> of a Laufzeitmessung <the RTI ID=3.18> language source< /RTI> in its spatial position to be recognized can do. The microphones after amount and phase in such a way added that the information signals are added and strengthened, those to the information signal not correlated <RTI ID=3.19> „spurious signals“< /RTI> to be however optimally faded out. Thus all microphones have a supporting function and to be involved into the evaluation also in. It concerns not giving the microphone signal subsequent treatment separates around an improvement into <the RTI ID=3.20> transmission chain< /RTI> fed <RTI ID=3.21> of Sprachsignale.</RTI>

The RTI ID=3 is <particularly favourable.22> both< /RTI> <RTI ID=3./RTI> and< RTI> ID=3 <would procedure-in accordance with-eat 23./RTI> basic idea<> of the invention would facility-in accordance with-eat 24 by the fact that a in this way selektiviertes microphone and/or. here at the basis the lying Laufzeitmessung with a positioning of the head of the speaking person to be combined can.

From US 5366241 are <RTI ID=3.25> means< /RTI> to the determination of the head position admits, which serve for the Airbagsteuerung. The head position is determined however with generated acoustic waves. A combination with a languageclaimant microphone is not thereby <RTI ID=3.26> mentions.</RTI>

In further <RTI ID=4.then>< so> the RTI ID=4 knows 1 favourable </RTI arrangement.2> over< /RTI> <the RTI ID=4.3> language source recognition< /RTI> and/or. the so-called virtual microphone local regulation head item data to be produced, over which the safety systems are qualified controllable. D. h., parallel to the usual speech enterprise with in-car telephones or phonetic input units additionally the head position is determined, without large RTI ID=4 <additional thereby.4> means< /RTI> to <the RTI ID=4.5> order places< /RTI> to <RTI ID=4.6> must.</RTI> D. h., the head is to the Airbagsystem in an unfavorable position, then the safety system can be headed for in such a way in the case of need that a Airbagauslösung is omitted.

The system is altogether multi-functional thereby whereby in <the RTI ID=4.7> substantial< /RTI> however <the RTI ID=4.8> given< to 8> increase /RTI of the language quality at the collection place. This leads to <a RTI ID=4.9> more understandable transmission< /RTI> during the speech enterprise with an in-car telephone plant. Beyond that with phonetic input-steered units in the motor vehicle the language commands are recognized more surely and converted.

The invention is in the design <RTI ID=4.10> represented< /RTI> and in the following <RTI ID=4.11> more near< /RTI> described.

It shows: Figure 1: <RTI ID=4.12> fundamental ones </RTI> structure in <RTI ID=4.13> system configuration.</RTI>

Figure 2: <RTI ID=4.14> remark example< /RTI> <RTI ID=4.15> for< /RTI> <a RTI ID=4.16> /RTI< according to invention> electronic structure.

In the figure 1 is the structure <of the RTI ID=4.17> fundamental< /RTI> elements as well as the functional connection <RTI ID=4.18> the same< /RTI> among themselves <RTI ID=4.19> represented.<> One does to /RTI thereby without detailed representations and one shows only a system configuration.

A majority of microphones 1.2.3, is spatially distributed arranged within the motor vehicle. Can with an appropriate <RTI ID=4.20> favorably< /RTI> <RTI ID=4.21> selected< /RTI> positioning also an arrangement with two microphones are sufficient. <RTI ID=4.22> over it< /RTI> outside it can be quite favourable to arrange even still more than three microphones. The choice of the microphone places is arbitrary thereby and can be firmly installed thus either in armatures, or by means of further fastening parts <RTI ID=4.23> spatially< /RTI> in the motor vehicle distributed its.

However the fact remains fundamental that per place several microphones <RTI ID=5.1> necessary< /RTI> become. <RTI ID=5.2> for< /RTI> an accurate 3-D-Lokalisierung becomes however 3 microphones <RTI ID=5.3> needs.</RTI> thereby <RTI ID=5.4> must <stretch> /RTI the microphone places a three-dimensional area and <RTI ID=5.5> may not <be appropriate> for /RTI in one level.

Against it if the microphones are too far from each other, then is Laufzeit-bzw.

Correlation measurement not sufficiently exactly.

<RTI ID=5.6> all< /RTI> microphones supplies thereby an appropriate signal, which to a gating 10 one unites. Now in the vehicle if a language message is given up, then this from all microphones is received. Since these are however spatially distributed, is on the one hand <the RTI ID=5.7> quality< /RTI> of the received signal differently, and on the other hand results during most exact evaluation of run time differences, those from the limited <RTI ID=5.8> speed of sound< /RTI> to be produced. Thus then a run time determination RTI ID=5 becomes within <the gating 10.9> accomplished,< /RTI> and from the correlation of all <RTI ID=5.10> microphone signals< /RTI> the place Geräusch-bzw. Language production determines. So <the RTI ID=5.11> determined< /RTI> spatial coordinates <RTI ID=5.12> for< /RTI> <the RTI ID=5.13> language source< /RTI> <RTI ID=5.14> permits< /RTI> then an electronic determination of the so-called virtual microphone place. In other words is called this, <RTI ID=5.15> that< /RTI> <the RTI ID=5.16> majority< /RTI> <of the RTI ID=5.17> microphone signals< /RTI> from distributes arranged microphones devoted from correlation of all signals the mentioned virtual microphone place, which <the RTI ID=5.18> most favorable< /RTI> position to the head of the speaking person copies. <RTI ID=5./RTI> changes< 19> now the

situation of the head, then this is registered accordingly again by the multiple arrangement of the microphones and by means of mentioned Laufzeitmessung the virtual microphone place by a shift of the priority <of the RTI ID=5.20> microphone signals< /RTI> quasi <RTI ID=5.21> adjusted.</RTI> the evaluation in electronic way takes place there, <RTI ID=5.22> run< /RTI> the entire procedure almost immediately, D. h., without considerable noticeable time delay, off.

A further procedure can consist however also of the fact that <RTI ID=5.23> in principle< /RTI> always all <RTI ID=5.24> microphone signals< /RTI> to be evaluated, and <RTI ID=5.25> by means of< /RTI> of a plausibility check by comparison of the individual <RTI ID=5.26> microphone signals< /RTI> the language message to be continuously verified knows.

Independently of now <the RTI ID=5.27> tatsächlich< /RTI> available procedure is the gating 10 in <a RTI ID=5.28> arrangement< /RTI> of the invention bi-directional signal-technically connected with a following microphone local regulation unit 20. <RTI ID=5.29> either< /RTI> a RTI ID=5 can do 29 within /RTI <of this microphone local regulation unit.30> receipt club regulation< /RTI> and an appropriate computation to be made or the selection of the momentary main micro hair dryer be specified.

That in the following the microphone local regulation unit is 20 again <RTI ID=6.1> signal-technically< /RTI> with a computation unit 30 connected, with their <RTI ID=6.2> assistance< /RTI> from <the RTI ID=6.3> determined< /RTI> data and/or. Signals a determining position of the head accomplishes becomes. Here now the large computation, for example in a comparison with samples, can lie. The comparison with samples knows thereby the computing time <RTI ID=6.4> substantially< /RTI> shorten, because then each mark does not have to be counted off initio. <The RTI ID=6.5> so-called "< /RTI> OF" position " out - positions of the head of the speaking person, regarding <a RTI ID=6.6> Airbag release, can be recognized< directly> /RTI. Thus the computation unit 30 with the signal generation RTI ID=6 <is following.7> for< /RTI> the safety systems 40 like Airbag, belt-taut and so on, connected.

The bi-directional connection SELF-SERVICE between <the RTI ID=6.>The control< /RTI> of the microphones, RTI ID=6 here in the center makes 8 for gating possible /RTI 10 and <the microphone local regulation unit 20.9> dependent< /RTI> on the position of the head of the speaking person.

Now if the head of the appropriate person moves during the speech enterprise, then an adjusting virtual of a microphone place takes place as it were by the invention. D. h., the speech enterprise begins with <a RTI ID=6.10> situation layer< /RTI> optimized microphone X 1 and change the position during the speech enterprise, then an adjusting of the optimal microphone place takes place during the speech enterprise for example by a misalignment on the microphone X 2 as quasi dominantes microphone. D. h., that once as optimally determined virtual microphone place <RTI ID=6./RTI> changes< 11> naturally if itself the situation of the head of the speaking person <RTI ID=6.12> changes.</RTI> this is in the nature of the invention <RTI ID=6./RTI> seizes< 13> and here in favourably simple way <RTI ID=6.14> solved.</RTI>

It is a special case if the virtual microphone place with one <the RTI ID=6.15> actual< /RTI> microphones <RTI ID=6.16> collapse.</RTI> mainly takes place however a collective microphone signal evaluation, with which the directional characteristic by appropriate shift that quasi ranking in the evaluation of the individual microphone signals to <the RTI ID=6.17> changed< /RTI> situation of the head <RTI ID=6.18> adapted< /RTI> becomes.

The microphone places arranged microphones is RTI <ID=6 distributes.19> dependent< /RTI> on the vehicle configuration. In principle favourably is thus the arrangement of at least 2 microphones per person. It can be also like that, <RTI ID=6.20> that< /RTI> a ungradzahlige number of microphones is used, whereby then one or several microphones are assigned to several persons and/or. are.

Figure 2 points a simple switching configuration in principle to <the RTI ID=7.1> realization< /RTI> in figure 1 only systematically <of the RTI ID=7.2> represented< /RTI> function mode.

The microphones 1.2.3 are connected with an adjustable amplifier 4.5.6 in each case. These adjustable amplifiers RTI <ID=7 are steered.3> over< /RTI> the evaluation mechanism 7. Two of the adjustable amplifiers can taxlaterally also coupled and/or. correlating coupled its. The moreover the individual amplifier output signals are likewise given on the mentioned evaluation mechanism 7. Parallel to it the strengthened microphone signals are switched to an adder 8, that at the output with the mechanism 9 to <the RTI ID=7.4> transmission< /RTI> of the audio signals interconnected is.



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<RTI ID=8.1> PATENT CLAIMS</RTI> 1. Procedure for the enterprise of a microphone arrangement, in particular with a motor vehicle, by the fact characterized that to adjusting a virtual, for the position <of a RTI ID=8.2> mobile</RTI> language source of optimized microphone place, the language sound at several spatially distributed places <RTI ID=8./RTI> seizes< 3> and from the evaluation of the variables, how running time and/or phase and/or amplitude, which individual microphone places are weighted and which are added accordingly audio signals of the microphones or combined otherwise.

2. Procedure for the enterprise of a microphone arrangement according to requirement 1, by it characterized, <RTI ID=8.4> that</RTI> the evaluation of the microphone signals and/or. the virtual microphone local regulation by a sound on time evaluation too and/or. between the individual microphones <RTI ID=8.5> takes place.</RTI>

3. Procedure for the enterprise after a microphone arrangement or several the preceding <RTI ID=8.6> requirements,</RTI> by the fact characterized that by simultaneous evaluations of all microphone signals the directional characteristic of the entire microphone arrangement by shift <of the RTI ID=8.7> reinforcement</RTI> or the phase or the running time of the individual <RTI ID=8.8> microphone signals</RTI> <of the RTI ID=8.9> changed</RTI> situation <of the RTI ID=8.10> language source</RTI> <RTI ID=8.11> /RTI< becomes> adjusted.

4. Procedure for the enterprise after a microphone arrangement or several of the preceding requirements, thereby characterized, <RTI ID=8.12> that</RTI> from <the RTI ID=8.13> determined</RTI> variable and/or. Parameters the situation/position of the Kop <RTI ID=8.14> fes/Sprachquelle</RTI> is determined and this as decision criterion <RTI ID=8.15> for</RTI> the release one consults by safety systems, like Airbag.

5. Mechanism for the enterprise of a microphone arrangement, in particular in a motor vehicle, with which <RTI ID=8.16> over</RTI> the microphone arrangement <RTI ID=8.17> Sprachsignale</RTI> into one audio or telephone system or into languagesteered input units of <RTI ID=9.1> devices</RTI> ready for input is characterized, or in the context of an active noise compensation, by it, <RTI ID=9.2> that</RTI> the microphone arrangement at least two <RTI ID=9.3> spatially</RTI> distributes arranged microphones (1.2...) <RTI ID=9.4>, /RTI< contains> that the signals of all microphones (1.2...) to a gating (10), and RTI ID=9 <are unitable.in the following> this< gating> (10) is logically in such a manner interconnected 5 that /RTI with means (20,30), <RTI ID=9.6> that</RTI> from the whole <of the RTI ID=9.7> microphone signals</RTI> to Schall-bzw. <RTI ID=9.8> language source</RTI> optimal microphone or <a RTI ID=9.9> collectively</RTI> <RTI ID=9.10> determinable</RTI> directional characteristic <RTI ID=9.11> temporarily</RTI> selectable/controllable is.

6. Mechanism for the enterprise of a microphone arrangement according to requirement 5, by the fact characterized that the mentioned <RTI ID=9.12> means</RTI> from a microphone local regulation unit (20) and a following further computation unit (30) exist.

▲ top 7. Mechanism for the enterprise of a microphone arrangement according to requirement 6, by the fact characterized that within the microphone local regulation unit (20) from <the RTI ID=9.13> simultaneous</RTI> evaluation of all <RTI ID=9.14> microphone signals</RTI> a virtual microphone local regulation is feasible, those the mobile position <of the RTI ID=9.15> language source</RTI> <RTI ID=9.16> adjustable</RTI> is.

8. Mechanism to the enterprise after a microphone arrangement or several <the RTI ID=9.17> requirements</RTI> 5 to 7, by it characterized, <RTI ID=9.>the signal-technical< connection> between gating (10) and the microphone local regulation unit (20) is bi-directional laid out for 18 that /RTI, in such a manner that <RTI ID=9.19> over</RTI> in the microphone local regulation unit (20) <the RTI ID=9.20> determinable</RTI> result of the virtual microphone place a back signal to the gating (10) is gebbar to head for over the microphones (1,2,3) after purposefully and/or. to call up.

9. Mechanism to the enterprise after a microphone arrangement or several <the RTI ID=9.21> requirements</RTI> 5 to 8, by it characterized, <RTI ID=10.1> that</RTI> the computation unit (30), in which from the determined data the respective current position <of the RTI ID=10.2> acoustic source</RTI> determinable, an evaluation took place in such a manner that in according to unfavorable position a blocking signal is gebbar on the safety systems (40), like Airbag, belt-taut and such a thing.

10. Mechanism to the enterprise after a microphone arrangement or several <the RTI ID=10.3> requirements</RTI> 5 to 8, by the fact characterized that to <the RTI ID=10.4> intended</RTI> evaluation of the microphone signals the microphones (1,2,3) are at the output with in each case an adjustable amplifier (4,5,6) connected, which in each case <RTI ID=10.5> individually</RTI> or coupled <RTI ID=10.6> over</RTI> an evaluation mechanism (7) is adjustable that <the RTI ID=10.7> exits</RTI> of the amplifiers (4,5,6) with one with a mechanism (9) to <the RTI ID=10.8> transmission</RTI> of the audio signals connected adder (8) is interconnected and the respective exits of the amplifiers (4,5,6) <RTI ID=10.9> parallel</RTI> also with the evaluation mechanism (7) are information-feeding back interconnected.

